Brachytherapy in the Treatment of Head and Neck Cancer

Quon and Harrison have performed a considerable service to patients with head and neck cancers by reminding the oncology community that a state-of-the-art treatment team must include state-of-the-art brachytherapy.

A fundamental adage in radiotherapy is "If you don’t hit it, you can’t cure it." Modern tools of external-beam radiotherapy, such as intensity-modulated radiation therapy, allow us to tailor radiation dose distributions (at least on the computer screen) to conform almost as tightly to the shape of the cancer as brachytherapy. In the head and neck region, however, ensuring that radiation always hits its target is not easy: Accurately repositioning and immobilizing inherently mobile structures such as the tongue, the mandible, and the cervical spine day after day, week after week can be quite difficult.

Advantages of Brachytherapy

With brachytherapy, one has the confidence that radiation is always hitting its target because the source of irradiation is located within the target, or right on it, rather than several feet away. Furthermore, the duration of the treatment, instead of weeks and months, is measured in days (and now, with high-dose-rate brachytherapy, in minutes). Brachytherapy is, therefore, quite appropriately described as the ultimate conformal radiotherapy and belongs in the armamentarium of physicians dealing with patients suffering from head and neck cancers.

Among the frustrations of being a head and neck brachytherapist is seeing patients after local recurrence and knowing that, if brachytherapy had been employed as part of the original planned treatment, the outcome would probably have been better. I shall, therefore, take this opportunity to amplify three of the issues discussed by Quon and Harrison in their comprehensive review, namely, (1) the role of brachytherapy in nasopharyngeal carcinoma, (2) the role of brachytherapy in the postoperative patient, and (3) the role of high-dose-rate brachytherapy.

Brachytherapy in Nasopharyngeal Carcinoma

Adequate external-beam irradiation to the nasopharynx and the retropharyngeal lymph nodes is constrained, even in the modern era, by the proximity of these sites to critical structures such as the brainstem, the optic chiasm, and the spinal cord. In the recent Intergroup study 0099, no brachytherapy was allowed, and as a result, one in three patients (23/69) treated by radiotherapy suffered local recurrence.[1] This was in striking contrast to several reports from the United States,[2-4] Europe,[5] and Asia,[6,7] suggesting that adding a planned brachytherapy boost to external irradiation led to local recurrences in fewer than 1 in 10 patients, and was quite safe.

The Postoperative Patient

It is well known that inability to obtain satisfactory margins of resection leads to local recurrence in most cases if no postoperative irradiation is given. What is not as well known is that patients with unsatisfactory surgical margins suffer more local recurrences even when postoperative irradiation is administered.[8-10]

Laramore[11] and Jacobs[12] analyzed a large Intergroup study that involved the delivery of 60 Gy by external beam after surgery for locally advanced head and neck cancers. Among patients with unsatisfactory margins, 26% suffered local recurrences, vs 11% among those with satisfactory margins. Since unsatisfactory margins reflect a larger residual tumor burden, those patients might benefit from a boost dose near the surgical suture line. In our experience, brachytherapy proved to be an excellent means of delivering such a boost, with little additional toxicity. Among patients with unsatisfactory margins treated by a planned brachytherapy boost, only 7% developed a local recurrence.[13,14]

Role of High-Dose-Rate Brachytherapy
The radiation safety problems associated with traditional low-dose-rate temporary implants in the head and neck region can be onerous, and have discouraged many radiation oncologists from employing brachytherapy. With high-dose-rate implants, on the other hand, the patient can stay in a standard room with unrestricted visiting and nursing care. Furthermore, high-dose-rate brachytherapy offers unprecedented opportunities for dose optimization.

A century’s worth of venerable literature exists regarding traditional low-dose-rate temporary brachytherapy for head and neck cancers, but in recent years, many studies and guidelines have strongly supported the notion that high-dose-rate approaches can be used in its stead for most indications.[15,16] Rare for brachytherapy, these publications have even included a prospective, randomized study.[17]

We initially employed high-dose-rate brachytherapy in previously treated patients.[18] Then, about 7 years ago, we felt comfortable enough with the strategy that we completely abandoned traditional low dose-rate temporary brachytherapy in favor of the high-dose-rate approach, and the results have been quite gratifying.[19]

References:
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